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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte KAI NUMSSEN and HELMUT KINDER

Appeal 2009-002870
Application 10/684,811
Technology Center 1700

Decided: September 8, 2009

Before LINDA M. GAUDETTE, KAREN M. HASTINGS, and JEFFREY B. ROBERTSON, *Administrative Patent Judges*.

ROBERTSON, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 1-10.[1] (App. Br. 2). We have jurisdiction pursuant to 35 U.S.C. § 6(b).

We AFFIRM.

THE INVENTION

Appellants describe a method for the manufacture of a high temperature superconducting layer on a substrate. Claim 1, reproduced below, is representative of the subject matter on appeal.

> 1. A method for the manufacture of a high temperature superconducting layer on a substrate comprising the following steps:
>
> a. deposition of an $RBa_2Cu_3O_7$ -1ayer onto the substrate with a low growth rate less than 1 nm/s, wherein R represents yttrium, an element of the group of rare-earth elements (atomic number 57-71) or mixtures of two or more of these elements;
>
> b. deposition of an $XBa_2Cu_3O_7$-1ayer onto the $RBa_2Cu_3O_7$-1ayer with a high growth rate greater than 1 nm/s, wherein X represents yttrium, an element of the group of rare-earth elements (atomic number 57-71) or mixtures of two or more of these elements.

THE REJECTIONS

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Hintermaier	US 6,177,135 B1	Jan. 23, 2001
Groves	US 6,899,928 B1	May 31, 2005[2]

[1] Claim 11 has been canceled. (Appeal Brief filed April 11, 2008, hereinafter "App. Br.," 2).

Kwon	US 6,943,136 B2	Sep. 13, 2005[3]

The Examiner rejected claims 1-10 under 35 U.S.C. § 103(a) as being unpatentable over Kwon in view of Groves. The Examiner also rejected claims 1-10 under 35 U.S.C. § 103(a) as being unpatentable over Kwon in view of Hintermaier and Groves.[4]

The Examiner found that Kwon discloses applying a superconducting buffer layer, followed by another superconducting layer, where both layers have the chemical composition required in claim 1. (Ans. 3). The Examiner stated that although Kwon generally discloses that the rate of formation (growth rate) can be varied, Kwon fails to disclose the specific rates of formation recited in claim 1. (*Id.*). The Examiner found that Groves discloses depositing buffer layers at 0.5 nm/s followed by depositing a superconducting layer at 2.0 nm/s to obtain improved lattice matching with the final superconducting layer. (*Id.*). The Examiner determined that it would have been obvious to modify Kwon by slowing down deposition of the superconducting buffer layer "with the expectation of achieving a higher quality buffer film which would in turn produce a higher quality superconducting film thereon based upon the crystallographic structure of the buffer film being continued throughout the superconducting layer." (Ans. 3-4).

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[2] Filed July 29, 2002.
[3] Division of Application of 09/152,813 filed September 14, 1998, now U.S. Patent No. 6,541,136.
[4] The Examiner withdrew the rejection of claims 1-10 under 35 U.S.C. § 103(a) as being unpatentable over Kwon in view of Nagaishi (U.S. Patent No. 5,248,649) and Groves. (Examiner's Answer entered July 3, 2008, hereinafter "Ans.," 2).

The Examiner also found that Hintermaier discloses lower growth rates for nucleation layers and increased growth rates for a second deposition step to facilitate compositional growth. (Ans. 4). The Examiner determined that in light of Hintermaier and Groves, it would have been obvious to slow down the deposition rate of the superconducting buffer layer of Kwon to obtain a higher quality buffer film. (*Id.*).

Appellants contend that Groves relates to materials and processes different than Kwon because Groves discloses a hetero-epitaxy process, while Kwon describes a homo-epitaxy process. (App. Br. 6-7). Appellants contend that adaptation of the crystallographic structure of the superconducting layer to the oriented MgO buffer layer of Groves is achieved by different layers of different materials and not by a slowly deposited YBCO ($YBa_2Cu_3O_{7-\Delta}$) buffer layer. (App. Br. 7). Appellants argue that deposition rates depend upon individual materials and cannot be transferred to other material systems because the formation of crystallographic structure depends on chemical composition, diffusion lengths, and temperatures. (*Id.*; Reply Brief filed September 9, 2008, hereinafter "Rep. Br.," 1-2). Appellants argue that Kwon discloses layers of yttria-stabilized zirconia (YSZ) or magnesium oxide as part of the substrate, which is different than the superconductor buffer layer. (Rep. Br. 4-5). Appellants contend that if one skilled in the art wanted to practice Kwon's method at growth rates greater than 2 nm/s, one would have grown both the superconducting buffer layer and the final superconducting layer at the same rate. (App. Br. 7-8). Appellants further contend that Hintermaier is not related to superconducting material, and therefore one skilled in the art

would not look to Hintermaier to improve the process of Kwon. (App. Br. 14; Rep. Br. 3-4).

ISSUE

Have Appellants shown that the Examiner reversibly erred in determining that it would have been obvious to deposit Kwon's buffer layer at a low growth rate of less than 1 nm/s and Kwon's superconducting layer at a high growth rate greater than 1nm/s in view of Groves or additionally in view of Hintermaier?

FINDINGS OF FACT

The record supports the following findings of fact (FF) by a preponderance of the evidence.

1. Kwon describes a superconducting structure including a "thin buffer layer of superconducting material" and a "layer of a rare earth-barium-copper oxide superconducting film thereon." (Col. 2, ll. 10-30).
2. Kwon discloses that the superconducting layer is "characterized as having chemical and structural compatibility" with the superconducting buffer layer. (Col. 2, ll. 31-42).
3. Kwon discloses that the material layers may be deposited by "pulsed laser deposition or by other well known methods such as evaporation, sputtering, or chemical vapor deposition." (Col. 3, ll. 62-64).
4. Kwon discloses "the base substrate in the present invention can be a dielectric oxide . . . or can be a composite material such as cerium oxide with a buffer layer of ytrria-stabilized zirconia." (Col. 3, ll. 5-13).

5. Groves discloses employing pulsed laser deposition for depositing both a yttria-stabilized zirconia (YSZ) buffer layer and a yttria buffer layer at rate of 0.05 nm/s and depositing a YBCO (superconducting layer) at a rate of 2 nm/s, where the buffer layers were used to obtain improved lattice matching with the final YBCO film. (Col. 6, ll. 4-12).

6. Hintermaier discloses that in depositing metal oxide films:

> [i]t may also be helpful to have nucleation control in the beginning, even if this increases the growth rate. After the nucleation step, the conditions are changed for a high growth rate in the second deposition step. Nucleation is very important for phase control and can be very important for composition control, for example, if the film composition depends on the nature of the surface.

(Col. 10, ll. 22-30).

PRINCIPLES OF LAW

Appellants have the burden on appeal to the Board to demonstrate error in the Examiner's position. *See In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006) ("On appeal to the Board, an applicant can overcome a rejection [under § 103] by showing insufficient evidence of *prima facie* obviousness or by rebutting the *prima facie* case with evidence of secondary indicia of nonobviousness.") (quoting *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998)).

"The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR Int'l. Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007). The Supreme Court further explained, "[w]hen a work is available in one field of endeavor, design incentives and other market forces can prompt variations of

it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability." *Id.* at 417.

ANALYSIS

Appellants have grouped certain claims subject to each of the two grounds of rejection separately. Accordingly, we confine our discussion to appealed claims 1, 2, and 6-9, which contain claim limitations representative of the arguments made by Appellants, and address other claims only to the extent that Appellants have argued them separately pursuant to 37 C.F.R. § 41.37(c)(1)(vii).[5]

We are unpersuaded by Appellants' argument that because Kwon and Groves disclose different materials for buffer layers, one of ordinary skill in the art would have no reason to employ a slower growth rate for Kwon's buffer layer than for the superconducting layer. Groves discloses that the buffer layers are employed to obtain improved lattice matching with the final superconducting film, where the buffer layers are deposited at lower growth rates than the overlaying superconducting layer. (FF 5). Similarly, Kwon discloses that the superconducting buffer layer has structural compatibility with the superconducting layer. (FF 2). Thus, one of ordinary skill in the art would have had a reason to deposit the buffer layer of Kwon at a low growth rate as evidenced by Groves. (*See* Ans. 5).

Moreover, Hintermaier provides additional evidence that depositing metal oxide films at a slower growth rate is generally known to aid in the

[5] Only those arguments actually made by Appellants have been considered in this decision. Arguments which Appellants could have made but chose not to make have not been considered and are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(vii) (2007).

control of nucleation. (FF 6). Therefore, contrary to Appellants' argument that deposition rates cannot be transferred to other material systems, Groves and Hintermaier provide evidence that employing a slow growth rate for deposition of metal oxide layers over substrates is important for the control of crystallographic structure. Accordingly, Appellants have failed to demonstrate that the claimed method provides more than predictable results obtained from applying a known method to known elements. Further, to the extent that Appellants argue that the deposition rates are process related, we note that both Kwon and Groves disclose that the buffer and superconducting layers are deposited using pulsed laser deposition. (FF 3, 5).

We are also not persuaded by Appellants' additional argument that Kwon discloses that the buffer layers of Groves are part of the substrate. Kwon discloses that the YSZ buffer layer on the substrate is optional. (*See* FF 4). Moreover, even if the YSZ buffer layer is present, Groves discloses the deposition of multiple buffer layers at a low growth rate. (*See* FF 4 and 5). Therefore, since Kwon discloses that the thin superconducting layer is a buffer layer, Appellants have failed to provide sufficient objective evidence that one of ordinary skill in the art would not have applied both the optional YSZ buffer layer and the superconducting buffer layer of Kwon at a low growth rate as suggested by Groves.

Appellants' argument with respect to claim 2, that one would have applied both layers of Kwon at a growth rate of greater than 2 nm/s is not persuasive in view of Groves and Hintermaier as discussed supra. (*See* Ans. 6). For claims 6-9, Appellants have not identified any error in, much less

addressed the Examiner's rationale for rejecting these claims. (*See* Ans. 6-7). Therefore, we are not persuaded by Appellants' arguments.

CONCLUSION

Appellants have failed to demonstrate that the Examiner reversibly erred in determining that it would have been obvious to deposit Kwon's buffer layer at a low growth rate of less than 1 nm/s and Kwon's superconducting layer at a high growth rate greater than 1nm/s in view of Groves or additionally in view of Hintermaier.

ORDER

We affirm the Examiner's decision rejecting claims 1-10 under 35 U.S.C. § 103(a) as being unpatentable over Kwon in view of Groves.

We affirm the Examiner's decision rejecting claims 1-10 under 35 U.S.C. § 103(a) as being unpatentable over Kwon in view of Hintermaier and Groves.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. §1.136(a)(1)(v).

AFFIRMED

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